

Concentration and Effects of Selenium in American Avocets and Black-necked Stilts

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Project Objectives

- Determine ambient concentrations of Se in water, sediment and in macroinvertebrates from each site
- Determine diet of AMAV & BNST at each study site



Project Objectives

- Determine concentration of Se in eggs, blood and liver of AMAV & BNST
- Determine productivity at each site
 - Total eggs
 - Hatchability
 - Total young
 - Nesting success





4 study sites located

- Ogden Bay
- Antelope Island, Bridger Bay
- Saltair
- West Carrington

Methods

- Each site visited every 3-4 days
- Nests located and monitored every 3-4 days



Methods

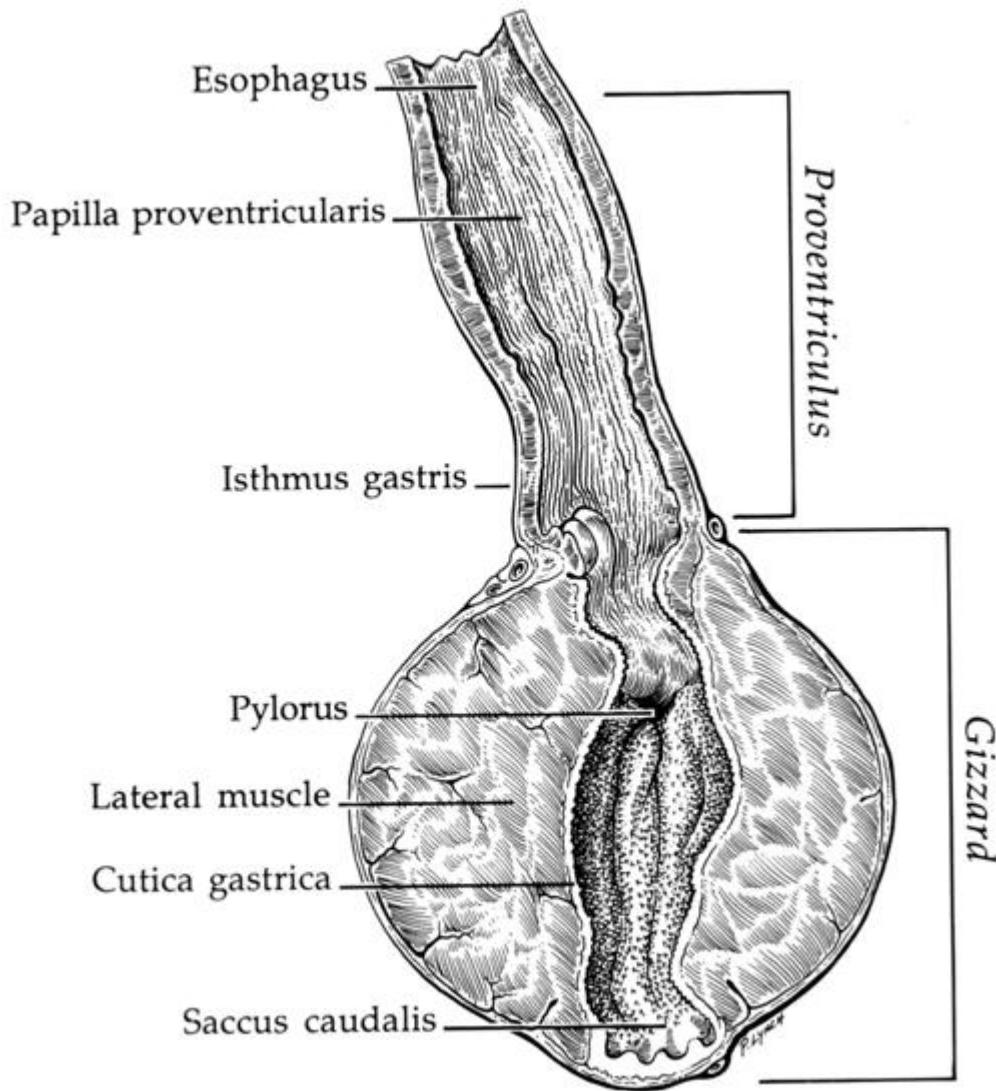
- Water, sediment and macroinvertebrates collected at each site from foraging areas.
- Samples prepared and shipped for Se analysis



Methods

- Adults collected & dissected in the field
 - Mouth rinsed
 - Esophagus, proventriculus, ventriculus preserved
 - Blood and liver samples collected





Methods

- Invertebrates identified to family, counted and volume of food items determined



Methods

- Eggs randomly collected from subset of nests at each site
- Embryos dissected and shipped for Se analysis



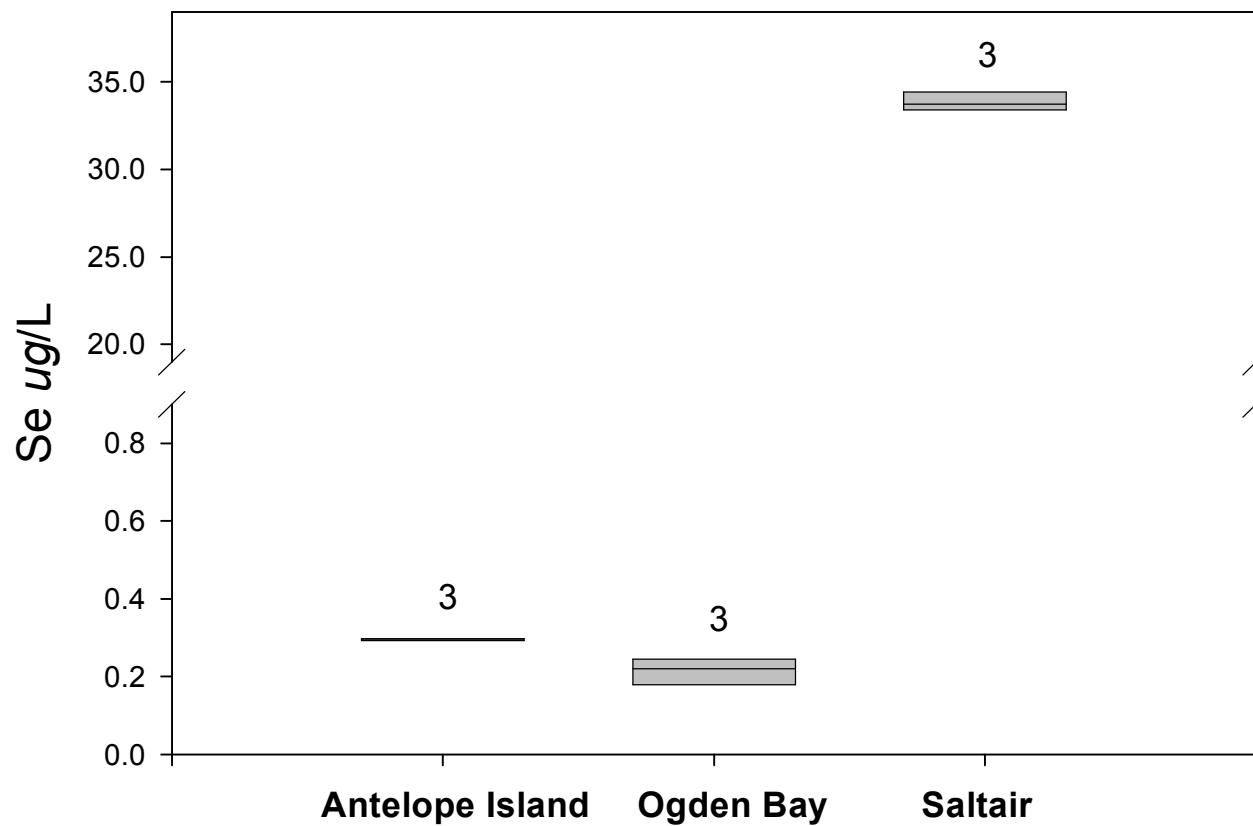
Nests Monitored

Antelope Island 196 AMAV

Ogden Bay 90 AMAV

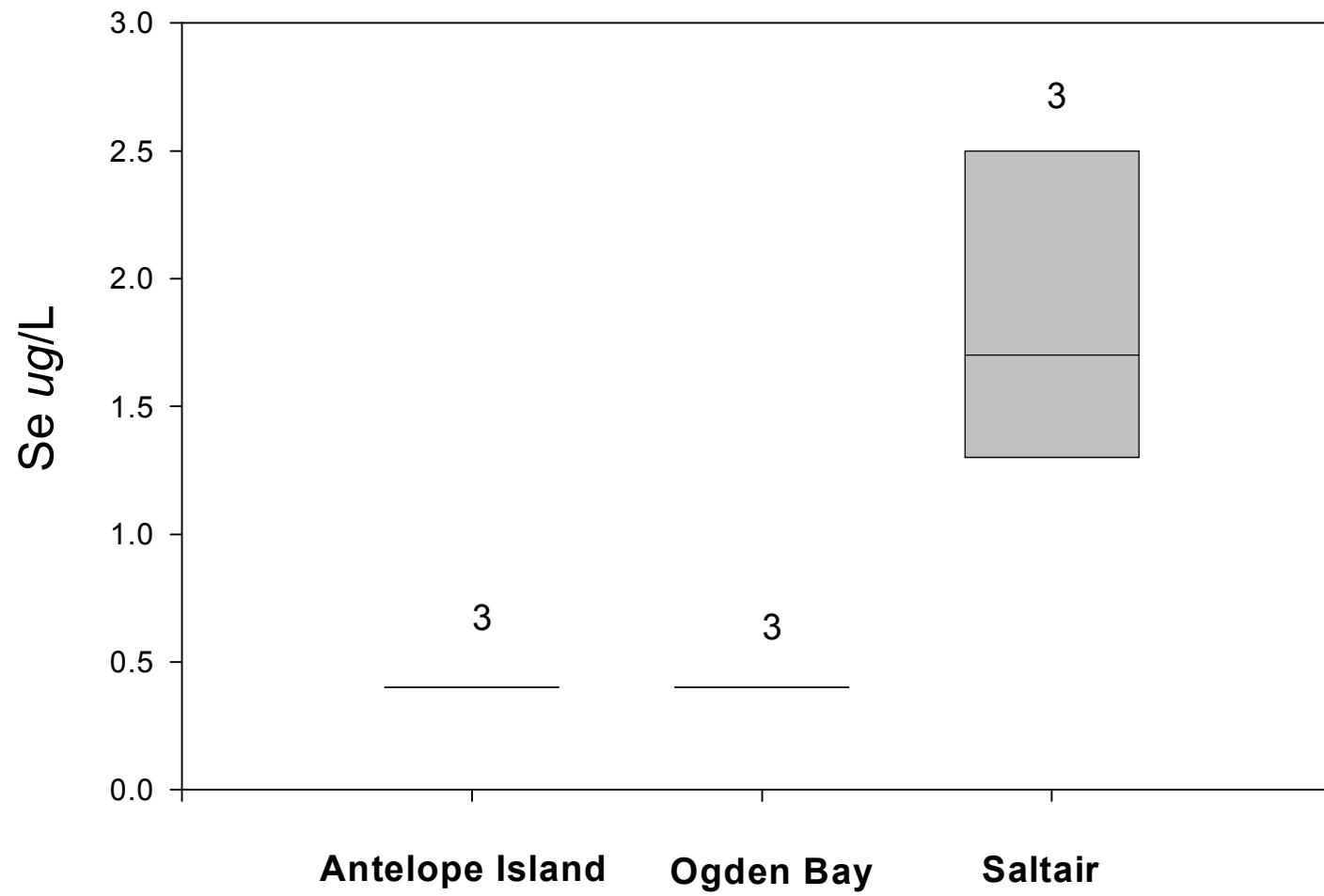
39 BNST

Saltair 13 AMAV



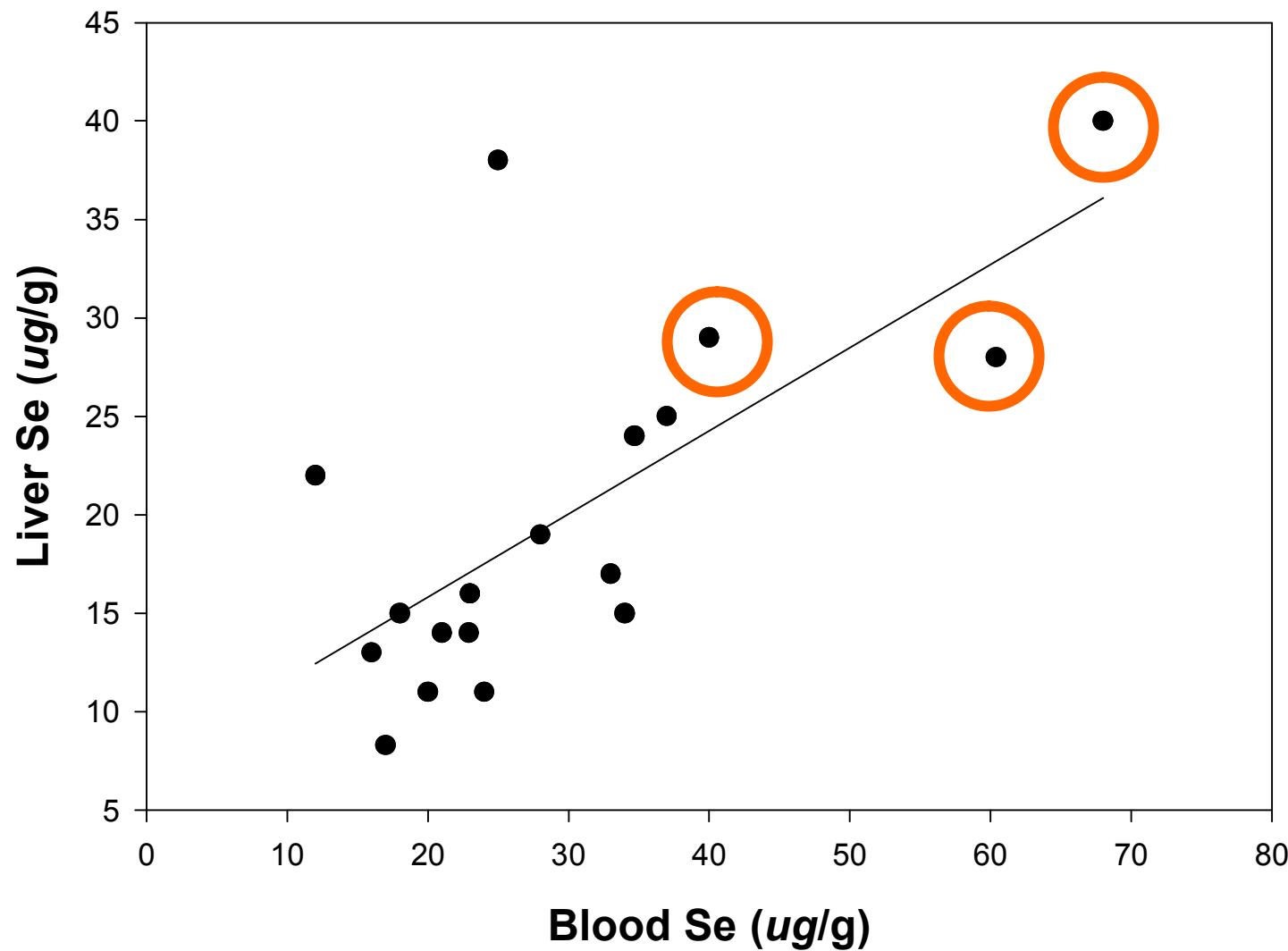
Median Se concentration from water samples at each foraging site

$(H = 7.2, df = 2, P = 0.004)$

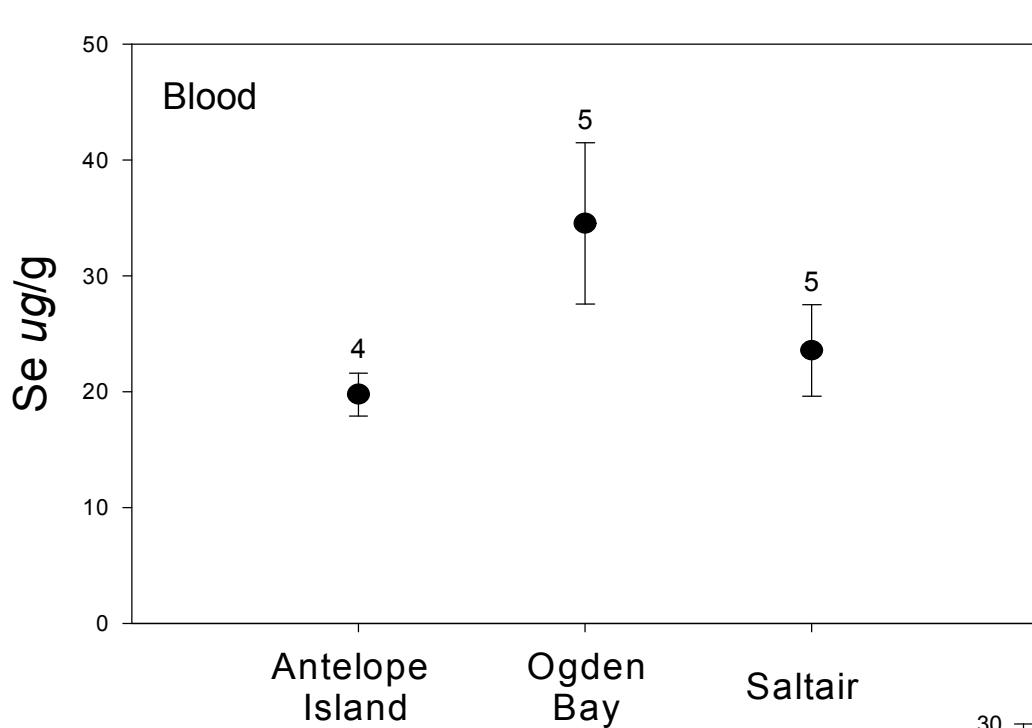


Median Se concentration from sediment samples at each foraging site

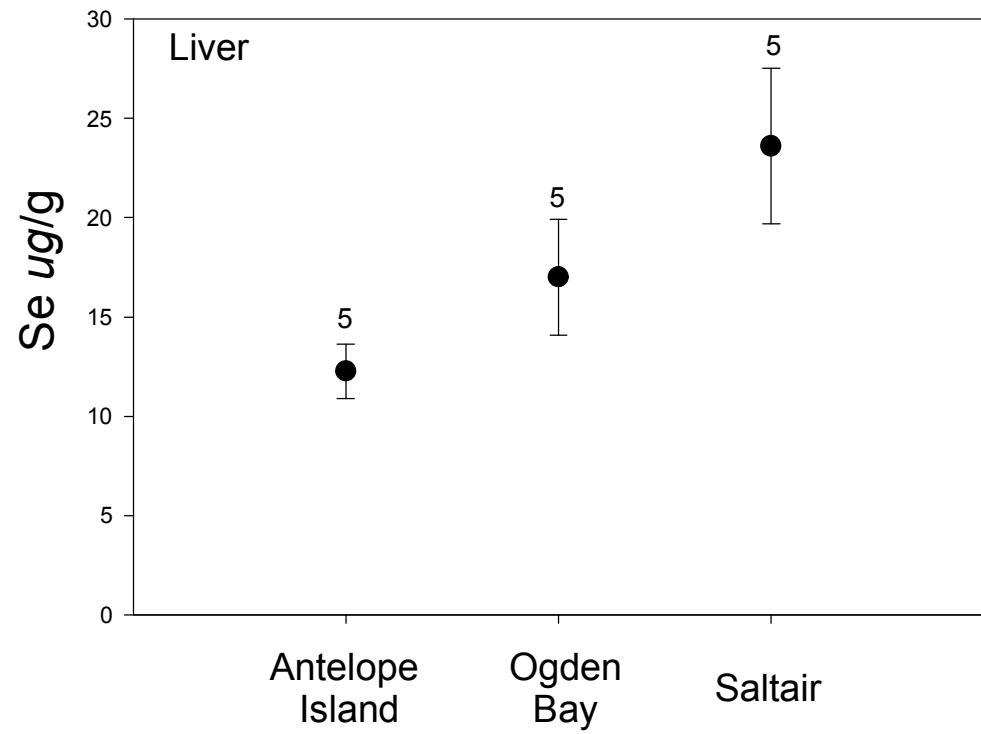
$(H = 7.7, df = 2, P = 0.07)$



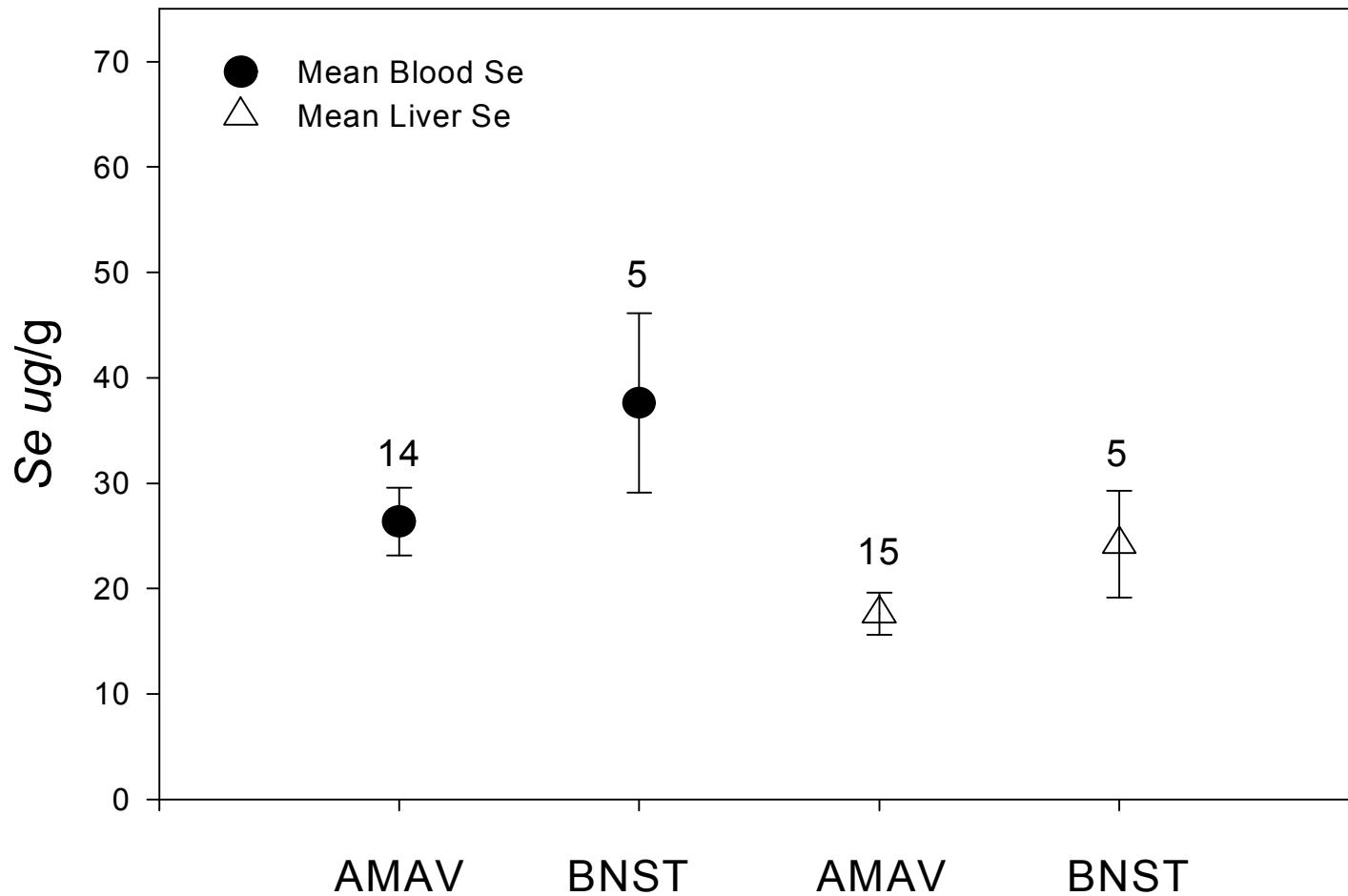
$$F_{1,18} = 15.29, P = 0.001, r^2 = 0.474; y = 7.37 + 0.422x$$



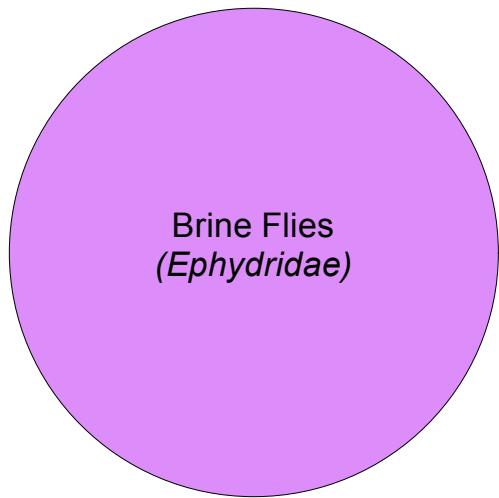
AMAV blood Se concentrations
 $(F_{2,14} = 2.276, P = 0.149)$



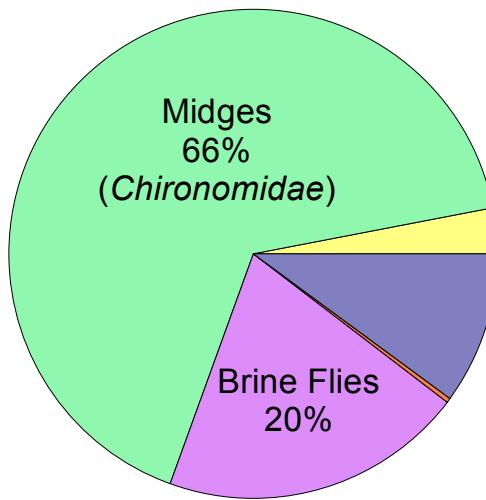
AMAV liver Se concentrations
 $(F_{2,14} = 3.79, P = 0.053)$



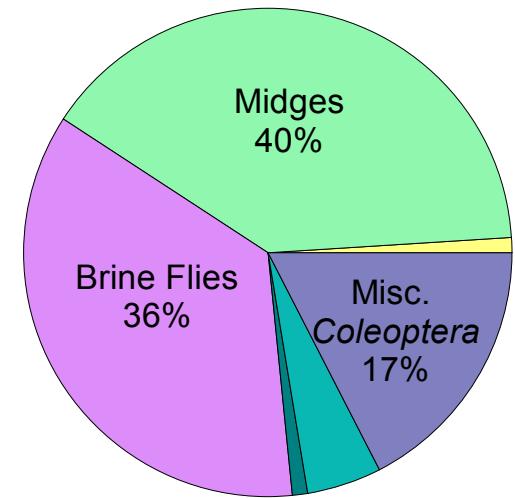
AMAV Dietary Analysis



Antelope Island



Ogden Bay



Saltair

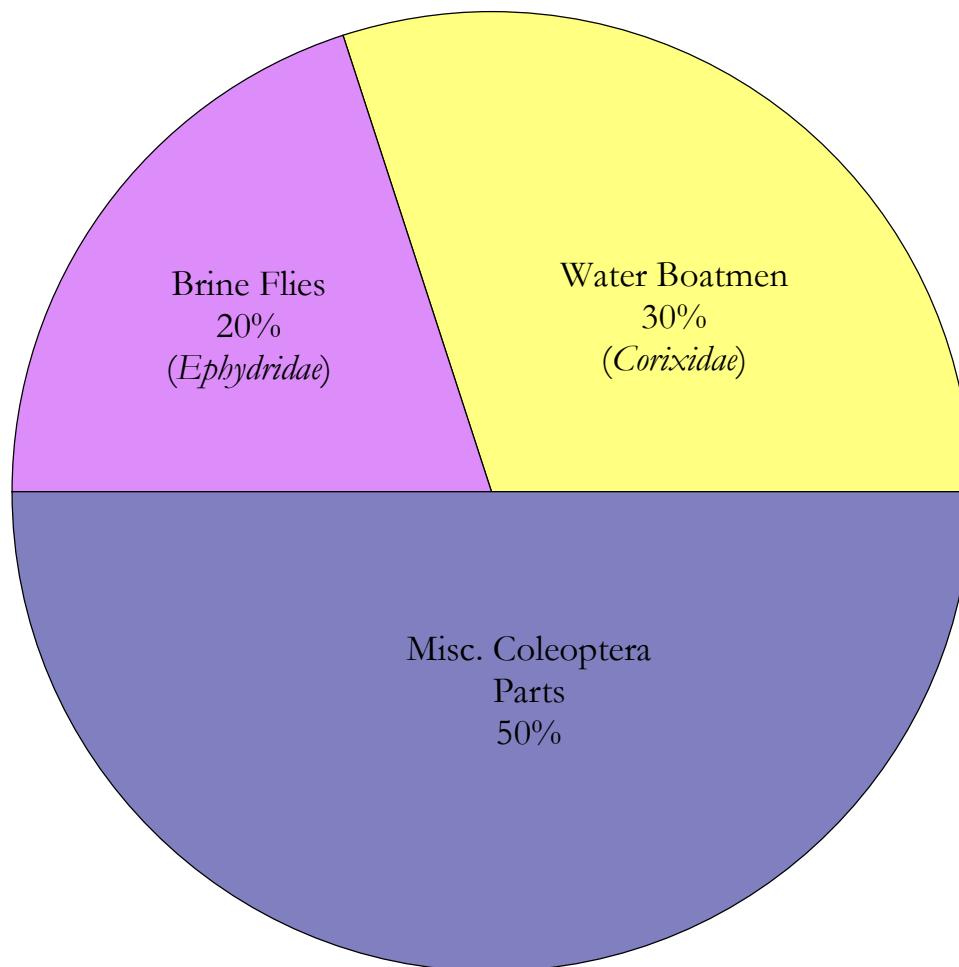
- █ Corixidae
- █ Misc. Hemiptera
- █ Chironomidae
- █ Ephydriidae
- █ Muscidae
- █ Dolichopodidae
- █ Braconidae
- █ Misc. Coleoptera

+76% of diet =

Chironomidae + Ephydriidae

BNST Dietary Analysis

Ogden Bay

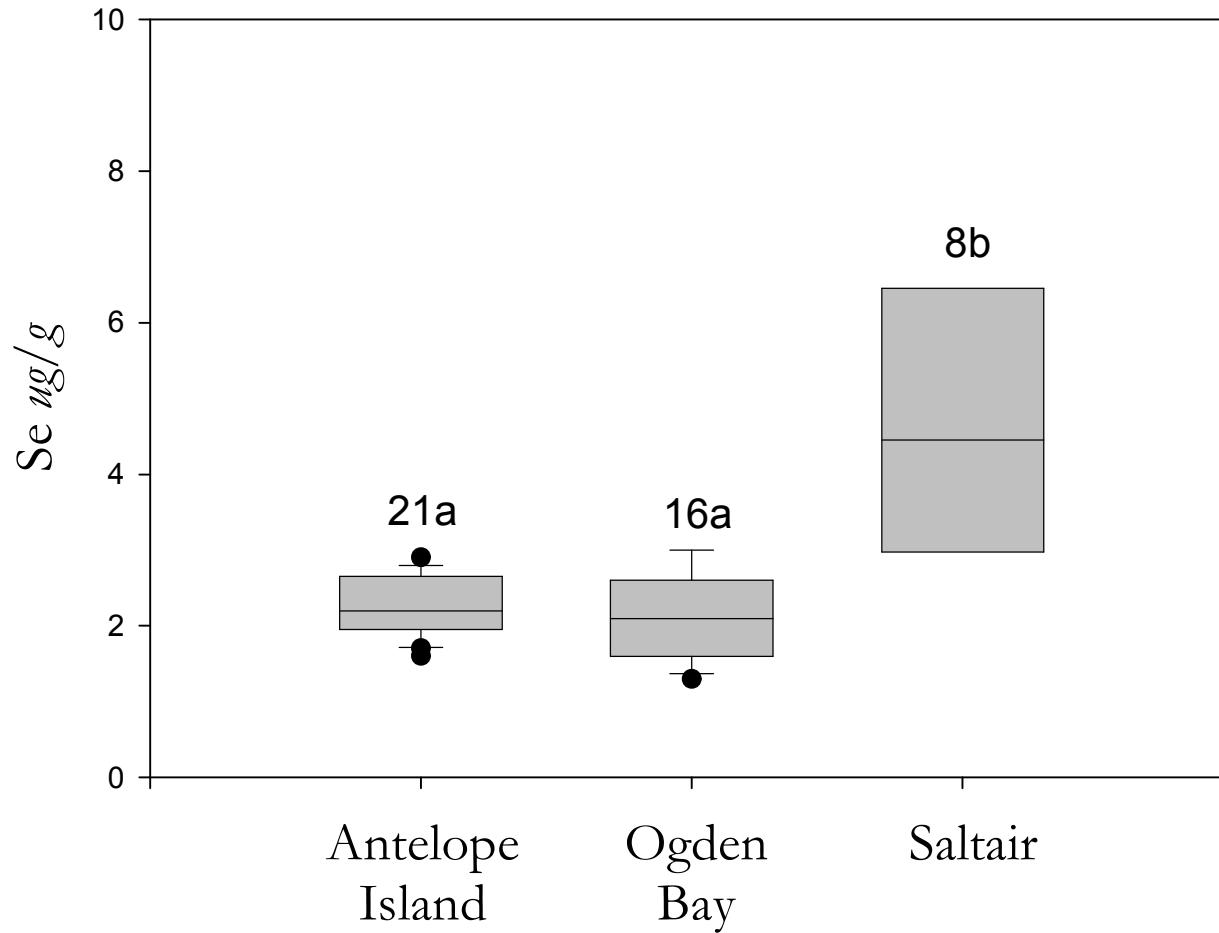


Se concentration ($\mu\text{g/g}$) of macroinvertebrates sampled within foraging areas

Site	Brine Fly	Chiron.	Corixid
ANT	0.8 – 2.3 (1.56 ± 0.2)	-	2.5
OGB	0.97 - 3 (1.66 ± 0.7)	2.0	2.0 – 3.0
SALT	1.9 – 3.8 (2.7 ± 0.4)	-	2.1

ID	Site	Se ug/g	Food Items (cm ³)
61306-3-aml BNST	OGB	40	Ephyd (0.04), Muscidae (0.05), <u>Coleop parts</u> (0.01)
6606-1-jfc AMAV	OGB	60.4	Corixidae (0.02), Carabidae (0.01), Chiron (0.24), <u>Dolichop.</u> (0.02), Ceratapog. (0.01), Plant Material (0.03)
6706-1-jfc BNST	OGB	68	<u>Odonat</u> (0.03), Corixidae (0.03), <u>Hydrophil</u> (0.01), <u>Coleop parts</u> (0.12), Ephyd (0.02)

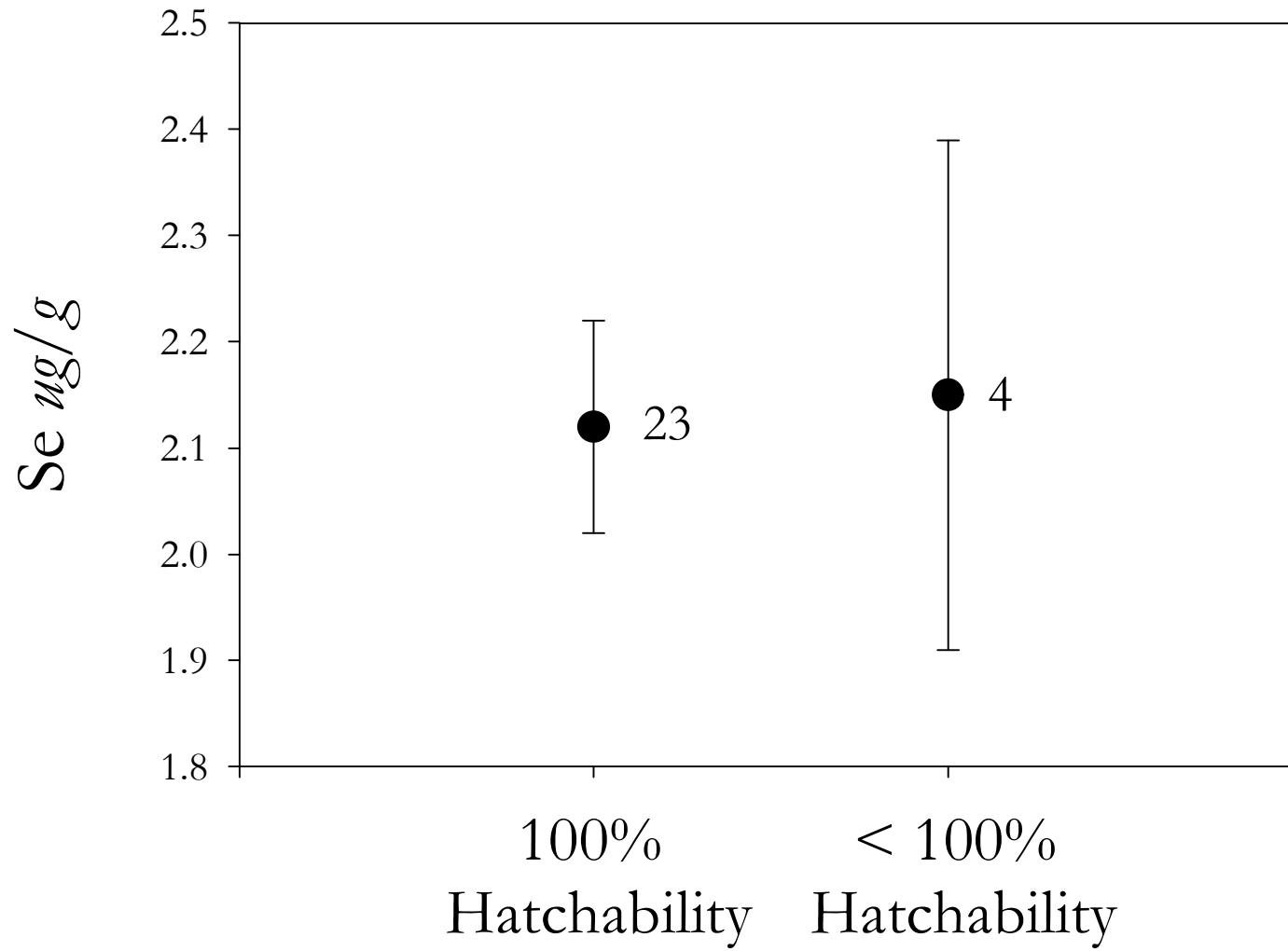
Egg Se Concentration



$$H = 15.85, df = 2, P = 0.001$$

Productivity

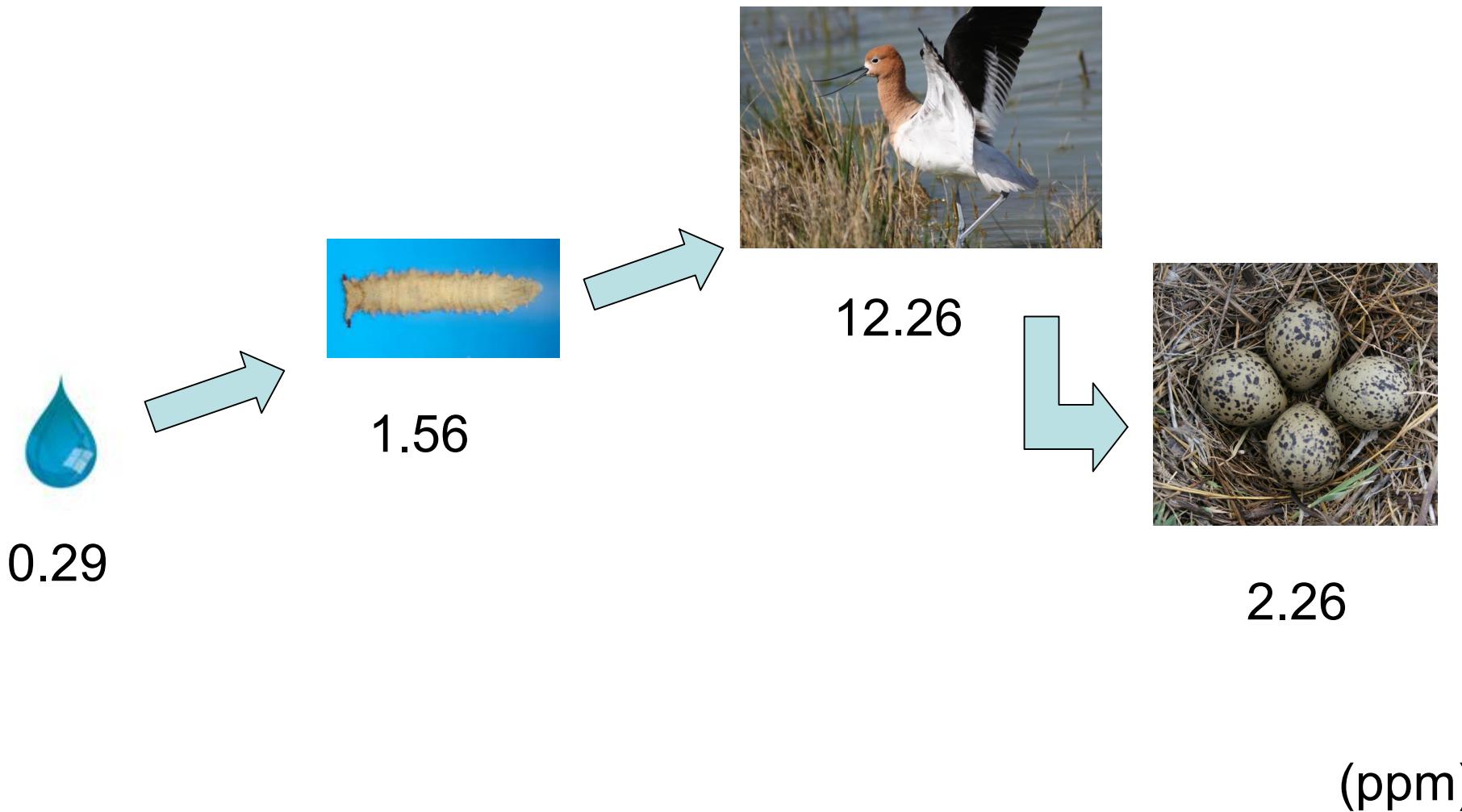
Site	Spp.	Total Eggs Laid (# nests)	Clutch Size (n)	Hatchability (n)	Total Young Produced	# Young Leaving/Nest (n)
Antelope Island	AMAV	669 (196)	3.77 ± 0.05 (90)	0.94 ± 0.01 (86)	293	3.42 ± 0.08 (86)
Ogden Bay	AMAV	296 (90)	3.77 ± 0.08 (44)	0.97 ± 0.02 (40)	137	3.34 ± 0.10 (41)
	BNST	137 (39)	3.84 ± 0.09 (19)	1.0 ± 0 (18)	70	3.33 ± 0.10 (21)
Saltair	AMAV	32 (13)	4.0 ± 0 (2)	-	0	-



$t = 0.12, df = 25, P = 0.905$

Super-simplified Conceptual Model

Se flow



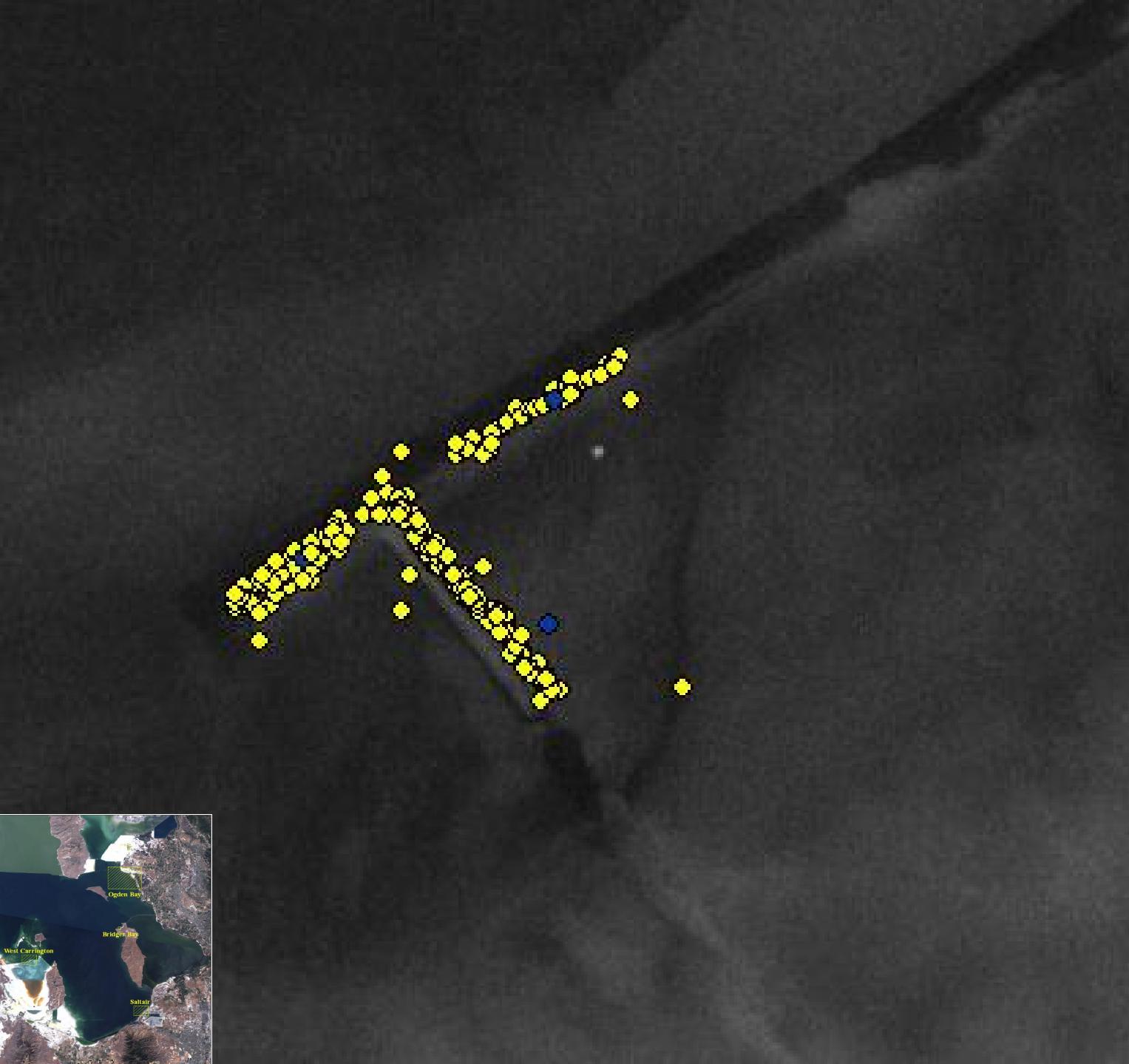
Bridger Bay



0 30 60 120 180 240 300
Meters

Nest Sites

- Other
- ◆ American Avocet





Ogden Bay



- Flooding on 6/9 – 6/10 resulted in substantial nest loss
- 2.18 cm rain
- Renesting occurred



Saltair



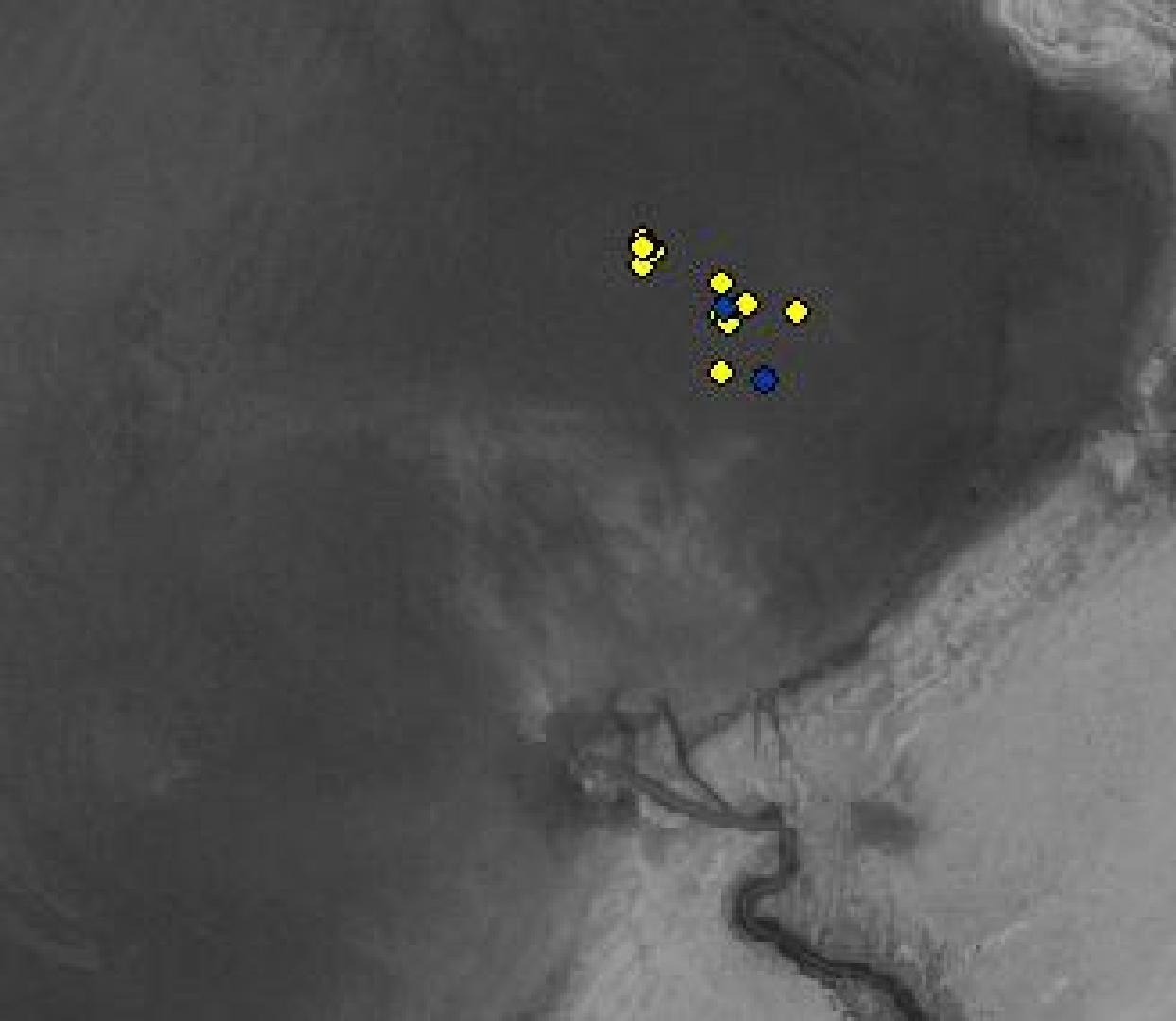
Kennecott
Discharge

0 0.1 0.2 0.4 0.6 0.8 1 Kilometers



Nest Sites

- Other
- ◆ American Avocet



- Flooding on 5/27 – 5/28 resulted in substantial nest loss
- 0.9 cm rain



- First nest initiated 5/24
- By 5/27 colony had 12 pairs
- Entire colony depredated by 5/30
- No renesting



